

# (12) UK Patent Application (19) GB (11) 2 185 561 (13) A

(43) Application published 22 Jul 1987

(21) Application No 8630615

(22) Date of filing 22 Dec 1986

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**A47F 3/04**

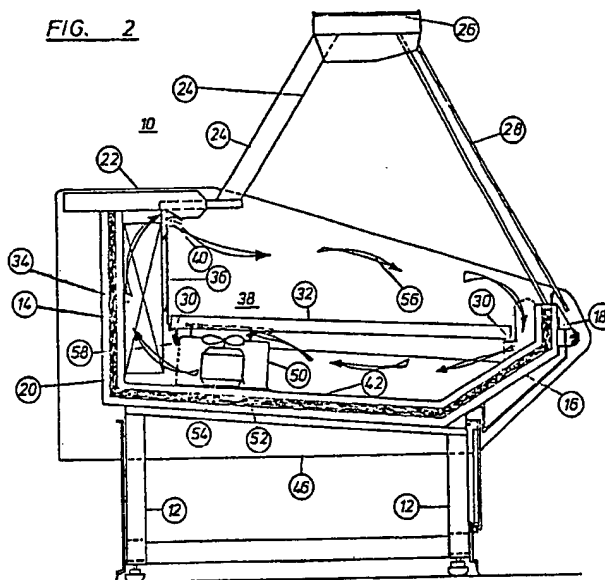
(52) Domestic classification (Edition I)  
**F4H 10 2A 2B 2H 2L 2N**

(56) Documents cited  
**GB 1100457**                      **GB 0645246**

(58) Field of search  
**F4H**  
**Selected US specifications from IPC sub-class A47F**

## (54) Refrigerated display cabinet

(57) A refrigerated display cabinet has a unit comprising a blower 52 combined with a barrier 50 which unit is positioned easily by hand in a channel of the cabinet. To avoid adhering of the unpacked meats to the supporting plates 32, the direction of the blower is selected, such that the refrigerated air flow leaving a wet evaporator 34 first takes-off the heat from the food to be refrigerated across its exposed surfaces, and subsequently passes along the undersides of the plates 32 at a slightly higher temperature, to be finally urged by the blower into the wet evaporator. With the unit removed from the display cabinet cooling is effected by convection (Fig. 1).



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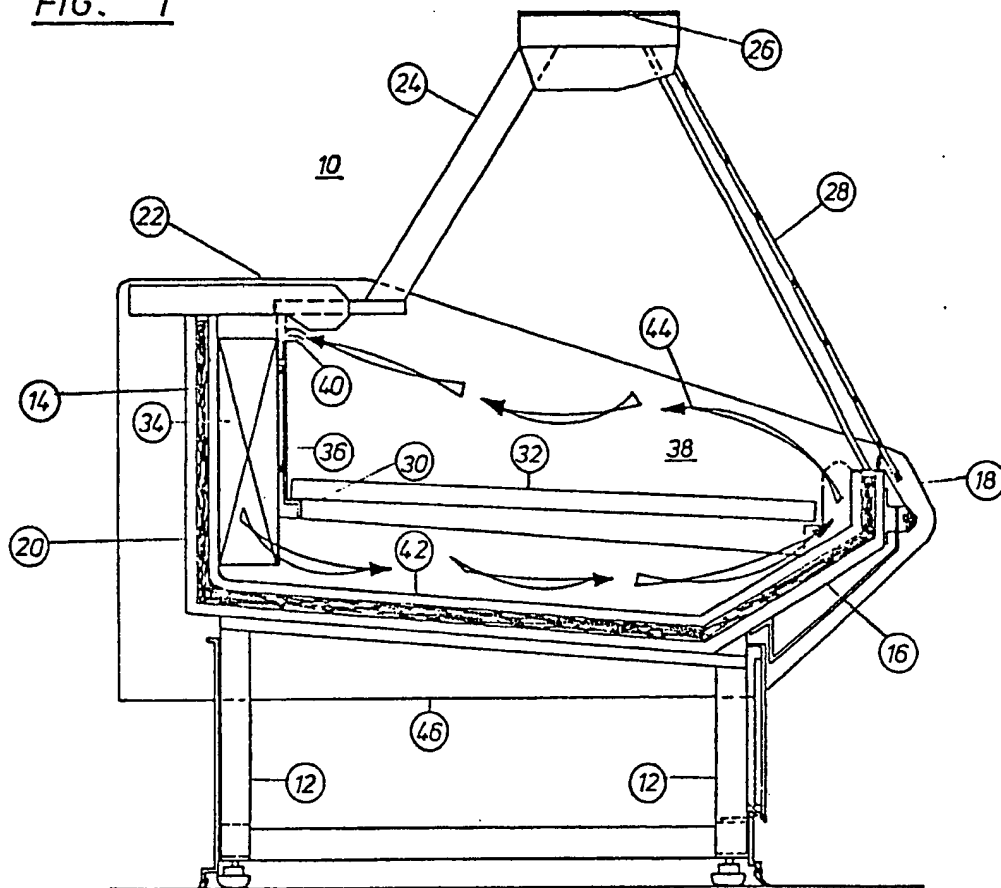
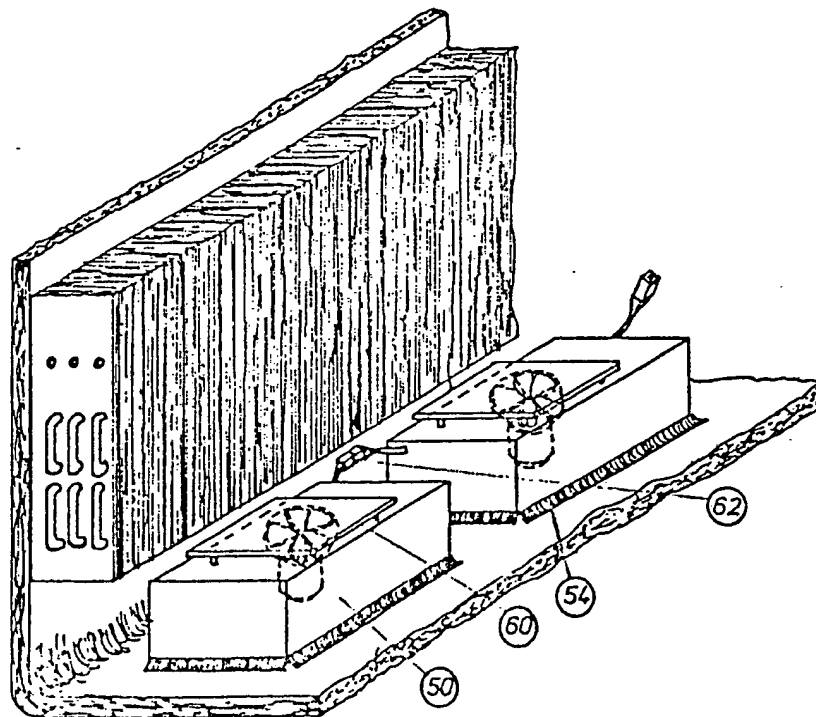
FIG. 1FIG. 4

FIG. 2

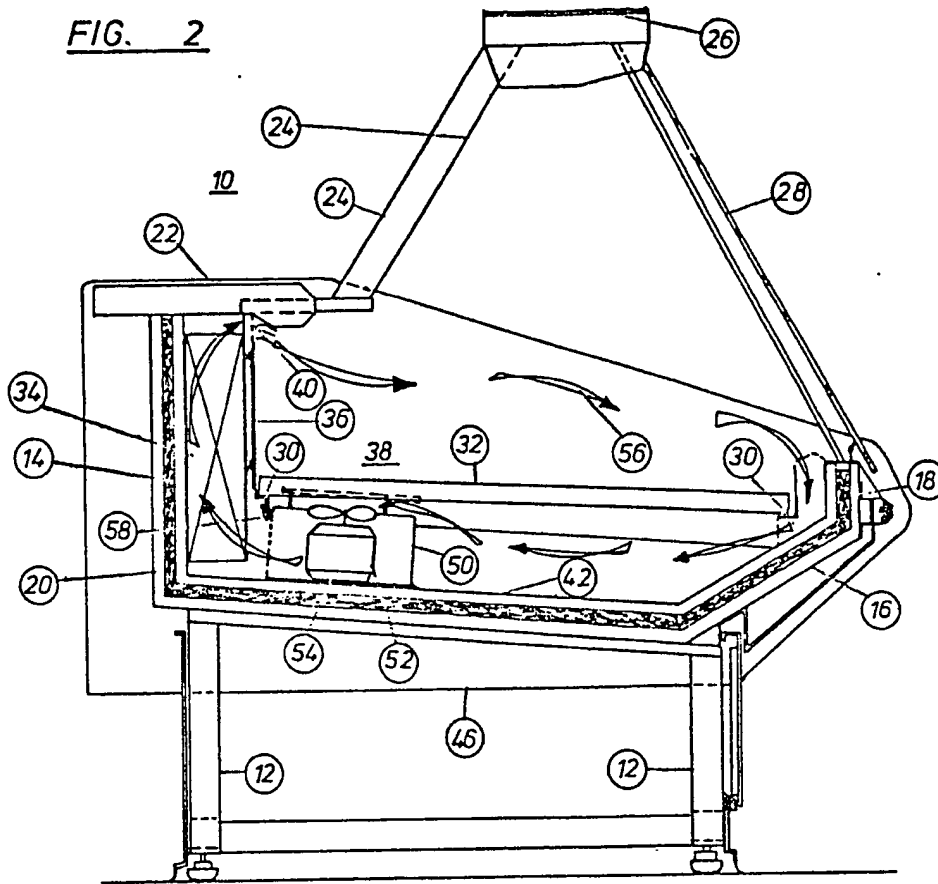
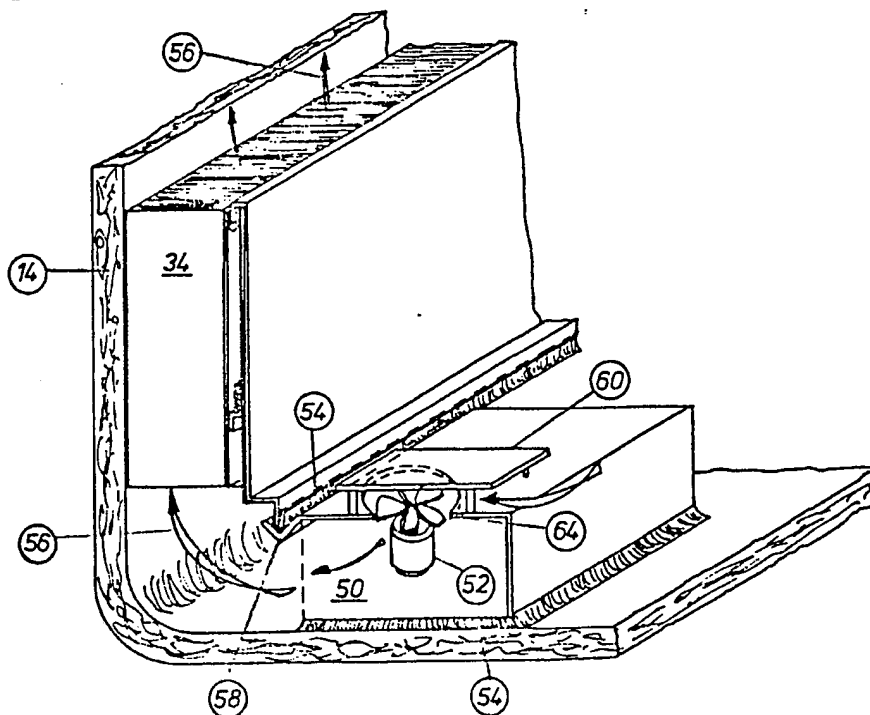


FIG. 3



## SPECIFICATION

**Bar of shop assistants with refrigeration by recirculated and circulating air, resp.**

5 The invention relates to a bar for servicing the customers in a shop, whereby an evaporator of a refrigeration plant and at least one blower are used for driving a refrigerated air flow along the evaporator and the  
10 food.

A refrigerated display case known from the German Patent no. 3,203,903 comprises a short, vertical front wall at its face, that is, at that flank, the customers approach; a glass plate inclined from the customers away is connected to that front wall, and they can look at the food lying in the interior of the display case through the glass plate. The foodstuffs are placed on nearly horizontal bottom plates capable of being swung out, and are displayed there, whereby  
15 the level of the bottom plates is slightly lower than the lower edge of the inclined glass plate. A slit-like space slightly narrowing towards the customers extends across the over-all width of the refrigerated display case below the bottom plates, and terminates as an aperture extending upwards between the front edge of the bottom plates and a baffle, which is fastened to the back of the upper portion of the front wall of the refrigerated display case. The  
20 opposite end of the slit-like space turns into a vertical chute, which is formed by tailed members of the bottom plates bent upwards, and by a vertical backwall of the refrigerated display case, whereby this backwall is nearly double the height of the front wall. A forward working plane is mounted for the seller near the upper edge of this backwall, and upwards its underside limits the vertical chute mentioned before together, and yet releases an opening towards the upper edges of the tailed members of the bottom plates.

At least two evaporators – or groups of evaporators – are established in parallel and juxtaposition within a chute formed in this way, and are driven in push-pull, so that always the one evaporator is in the defrosting phase, and the other evaporator brings  
45 about the refrigeration at the same time. As a result the air present in the chute and the air flowing through it, resp., cools down and simultaneously sinks down due to its gravity, and thereby draws the warmer air from the space above the bottom plates, on which the food to be refrigerated have been laid down. The air cooled down enters the narrow, slit-like space beneath the bottom plates, and is passed along the undersides of the bottom plates, and draws-off the heat downwards through the bottom plates and the food lying on them. Thereafter the air  
55 slightly warmed up rises from the slit-like space around the front ends of the bottom plates along the baffle upwards, and reaches the space above the bottom plates and the food to be refrigerated, from which space it is exhausted towards the evaporator.

The loop of a relatively slow convective flow caused in this way is quite sufficient for refrigerating a plurality of foodstuffs, such as fruit, vegetables, chocolates, cheese. This first type of the refrigeration  
65 of food in a refrigerated display case is also designa-

ted to be a "quiet refrigeration".

One or more blowers, however, can also be provided, and circulate the air, that is, accelerate the refrigerated air flow along the loop. This second type  
70 of the refrigeration of food in a refrigerated display case is also designated to be a "recirculated refrigeration".

The acceleration of the air driven by the blowers in the loop does not only result in more intense drawing-off the heat in the evaporator and consequently in an operation at lower temperatures of the air, as compared with the "quiet refrigeration", but it also results in an augmented ice formation on the surfaces of the evaporator, because the accelerated air  
80 flow draws-off the humidity from the food with increased rates. – From this reason the provision of the second evaporator subjected to a defrosting phase, while the first evaporator is in the refrigerating phase, i.e. the two evaporators operate in push-pull, appears to be absolutely necessary.

Furthermore it is known that e. g. unpacked meats are said in the German Patent no. 3,203,903 to be deposited in the space of the refrigerated display case at a temperature between 0 and +5 degrees Centigrade, and at a humidity up to 80 per cent. To draw-off the humidity as little as possible from the displayed, unpacked meats within the display case, the circulating air is refrigerated by evaporating elements comprising surfaces of heat-exchange as  
90 large as possible. As a result of this measure the difference of the temperatures is diminished between the air within the space of the display case and the surfaces of the evaporator, and consequently the formation of frozen fog on these surfaces. – Together these statements prove that also only one evaporator comprising large surfaces, a so-called "wet evaporator" can be used in lieu of both evaporators arranged in juxtaposition, and comprising small surfaces, which operate in push-pull, that is, in the refrigerating and defrosting phase, resp., without a disturbing  
105 formation of frozen fog to be expected.

The relatively long path of the refrigerated air leaving the evaporator through the narrow, slit-like space along the undersides of the bottom plates proves to be unfavorable in the "recirculated refrigeration". For a considerable amount of the heat is drawn-off by the heat conduction on said way across the bottom plates likewise from the meats displayed on the bottom plates through their bases, so that the bases accept a lower temperature than the free surfaces of the unpacked meats. If the latter are said to be kept in the range of temperatures between 0 and +5 degrees Centigrade, the refrigerated air leaving the evaporator must be of a temperature near zero degree Centigrade or slightly lower with the result that the bottom plates cool down lower than zero degree Centigrade, too. As a result the unpacked meats adhere on the bottom plates due to an ice formation, and must be torn away by seller's hand, while taking-off, whereby leftovers appear often on the bottom  
110 plates, which have therefore to be cleaned frequently. They can also be removed, after the blowers were switched-off, that is with a transient to the "quiet refrigeration", whereby the bottom plates reach temperatures above the freezing point after  
120 125 130

some waiting period.

It is an object of the invention, to provide a bar for servicing the customers of a shop with means making the bar suitable to be refrigerated both in a "quiet  
5 refrigeration" and in a "recirculated refrigeration", whereby the temperature within the space of the food is lower than the temperature of the bottom plates, so that the food is prevented from adhering on the bottom plates due to an ice formation in the  
10 "recirculated refrigeration".

According to the invention a combination is provided, of a barrier suitable to be easily inserted by hand in the channel system, and of a blower, the direction of drive of which is selected, such that the refrigerated air emanating from the evaporator arrives  
15 directly at the free surfaces of the displayed food.

In the "recirculated refrigeration" the long path of the air flow from the food to be refrigerated along the undersides of the bottom plates up to the input of the  
20 evaporator enables to receive an additional quantity of heat in the air flow, so that, when passing the evaporator, it tries to receive the humidity too, and is conducive to prevent the formation of frozen fog on the surfaces of the evaporator.

An exemplary embodiment of the invention is illustrated in the drawings and explained in the following specification in more detail. There is shown in  
25 *Figure 1* a bar for servicing customers of a shop being operated by means of a "quiet refrigeration", as known per se;

*Figure 2* the bar of *Figure 1*, in which the combination of the barrier and blower has been inserted in accordance with the invention, whereby the direction of the drive of the blower is also selected according to the invention;  
35 *Figure 3* a side view of the combination of *Figure 2* in more detail for illustrating the separation between the pressure and suction chambers of the blower;  
*Figure 4* a schematic view of the combinations of  
40 barriers and blowers, as connected together.

A part-sectional view of a bar 10 for servicing customers of a shop is illustrated in *Figures 1* and 2, and is established on a few feet 12 in butcher's or baker's shop, in a food store or in a similar shop. It  
45 comprises a troughlike, double-walled frame 16 filled with an insulating material 14, and having a short, vertical front wall 18 at its front, which the customers approach, and a considerably higher, vertical backwall 20 at its back. A horizontal working  
50 platform 22 for wrapping up the food by the seller is mounted on the backwall 20 of the frame 16, whereby a few supports 24 extend with inclination from the front edge of the working platform 22 upwards, to support a horizontal operating desk 26. At  
55 the front an inclined glass plate 28 suitable to be easily removed by hand, the lower edge of which substantially extends in the level of the upper edge of the front wall 18 of the frame 16, abuts against this operating desk 26, on which the wrapped commodities are put by the seller, and, if desired, the  
60 money of the customers is laid down.

Supports provided with passages (not shown) are mounted within the trough-like frame 16 adjacent the front wall 18 and with spacing from the backwall  
65 20, whereby a few bottom plates 32 can be laid on the

supports 30 in a mutual close juxtaposition after the removal of the glass plate 28 by hand; the seller puts the food to be displayed on the bottom plates after the insertion of the glass plate 28, and he grasps  
70 through between the supports 24.

An evaporator 34 of a refrigeration plant provided with a plurality of air channels (not shown), and screened by a cover plate 36 against the space 38 towards the front, where the food is preserved, is between the support 30 at the back and the backwall 20  
75 of the frame 16.

The cover plate 36 also rests upon the support 30 at the back, and terminates above for leaving a horizontal slit 40 with spacing from the underside of the working platform 22.  
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After the design of the present bar 10 for servicing the customers of a shop has been specified, the attention is drawn to its "quiet refrigeration", as known per se, whereby the course of the air flow is  
85 shown by arrows 44 (*Figure 1*).

In the operation of the refrigeration plant, while the liquid refrigerant is led to the evaporator 34, the air cooling down in the air channels of the evaporator 34 drops to the bottom 42 of the troughlike frame 16  
90 through the passages of the support 30 at the back due to its gravity, whereby the warmer air is drawn into the evaporator 34 through the slit 40 from the space 38 comprising the food. The mass of the refrigerated, heavy air finally reaches the undersides of the bottom plates 32, which remove the heat from the food lying on them through their areas of deposition due to the heat convection. Finally the refrigerated air enters the space 38 by rising up through the passages of the support 30 at the front, and then removes the heat through the exposed surfaces of the food. The air warmed up by the food rises again and is sucked in by the evaporator 34 through the slit 40.  
100

In the "quiet refrigeration" the speed of the air flow substantially depends on the difference of the temperatures between the air entering the upper end of the evaporator 34 and the air leaving the lower end of the evaporator 34 through the passages of the support 30 at the back, and is consequently greatest short after switching-on the refrigeration plant. Subsequently this speed decreases down to a small, but constant value, whereby the temperature, however, cannot sink down to the freezing point of the water.  
105

As one can see from *Figure 2*, the bar 10 for servicing the customers of a shop can also be driven by a "recirculated refrigeration". For this purpose the combination of a barrier 50 and blower 52 is inserted by few movements of the hand into the channel system guiding the air flow, whereby the direction of the drive of which blower is selected, such that the flow of the refrigerated air leaving the evaporator 34 immediately reaches the free surfaces of the food to be refrigerated, thus is the space 38 through the slit 40, as it is also indicated by arrows 56. The refrigerated air draws off some quantity of heat from the food within the space 38 with the result that the air, which is driven from the space 38 through the passages of the support 30 at the front below the bottom plates 32, is warmer than that air entering the space 38. The bottom plates 32 very fast accept the temperature of this warmer air sliding along their undersides by the  
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120  
125  
130

heat convection, and normally remains on a temperature above the freezing point of the water, so that the food is prevented from adhering to an ice formation.

- 5 According to the invention the barrier 50 of the channel system combined with the blower 52 is hinged on a rail 58 of the support 30 at the back as airtight as possible, so that the own weights of the bar 50 and of the blower 52 press down a plurality of sealings 54 extending around the periphery of the underside of the barrier 50 against the bottom plates 32, as it could be seen from Figures 3 and 4. The continuous barrier 50 extends between the two side-panels 46 across the width of the bar 10, so that it effectively disrupts the convective air flow of the "quiet refrigeration". As mentioned before, the blower 52 arranged in the middle of the barrier 50 is driven in that direction, in which the air flow causing the "recirculated refrigeration" is opposite to that of the "quiet refrigeration".

Preferably a protective plate 60 is mounted in a predetermined distance from the barrier 50, and prevents the interior of the blower 52 from receiving droplets of water, which can deposit by a condensation at the undersides of the bottom plates 32. The same is true for liquids, which leak between a pair of juxtaposed bottom plates 32. Furthermore the flow rate of the air through the blower 52 can be limited in a suitable manner by adjusting the space between the top of the barrier 50 and the underside of the protective plate 60.

As Figure 4 shows furthermore, the blowers 52 of a pair of bars 10 for servicing the customers of a shop established in juxtaposition, or of two portions of such a bar 10 closed by a pair of side-panels 46 laterally, can easily be connected in common through a plug connection 62 to the power supply.

#### CLAIMS

1. Bar for servicing the customers of a shop comprising an evaporator fed by a refrigerant from a refrigeration plant, and refrigerating an air flow through a channel system of a closed loop, in which the refrigerated air flow is guided from the evaporator over the food to be refrigerated and is fed back to the evaporator, and at least one blower for accelerating the refrigerated air flow, wherein a combination of a blower and a barrier is used, which is suitable to be inserted by hand easily into the channel system, and wherein the direction of the drive of the blower is selected, such that the refrigerated air flow leaving the evaporator is immediately supplied to the free surfaces of the food to be displayed.
2. Bar according to claim 1, wherein the blower is mounted in a recess of the barrier being shaped as an elongated, cornered clamping ridge, which is provided with sealings at its pivot and at its bottom.
3. Bar according to claim 1 or 2, wherein a protective plate is mounted in a predetermined distance over the top of the barrier for protecting the blower against dropping liquids, and limits the flow rate of the air through the blower.

Amendments to the claims have been filed, and have

the following effect:-

- (a) Claims 1 and 2 above have been deleted or textually amended.
- (b) New or textually amended claims have been filed as follows:-

1. Bar for servicing the customers of a shop comprising an evaporator fed by a refrigerant from a refrigeration plant, and refrigerating an air flow, and comprising a closed flow route, in which the refrigerated air flow is guided from the evaporator over the food to be refrigerated and is fed back to the evaporator, wherein a barrier carrying a blower is suitable to be inserted by hand in the flow route, and to be arranged in the flow route, and wherein the direction of the drive of the blower is selected, such that the refrigerated air leaving the evaporator arrives at the free surfaces of the displayed food immediately.
2. Bar according to claim 1, wherein the blower is centrally mounted in a recess of the barrier present in the form of an elongated, cornered clamping ridge, which is provided with sealings at its pivot and at its bottom.

Printed for Her Majesty's Stationery Office by  
Croydon Printing Company (UK) Ltd, 6/87, D8991685.  
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,  
from which copies may be obtained.